

**GROUNDWATER MONITORING - ANNUAL EVENT  
MARCH 2004  
BOEING REALTY CORPORATION  
FORMER C-6 FACILITY  
LOS ANGELES, CALIFORNIA**

**by**

**Haley & Aldrich, Inc.  
San Diego, California**

**for**

**Boeing Realty Corporation  
Long Beach, California**

**File No. 28882-101  
27 April 2004**

**HALEY&  
ALDRICH**

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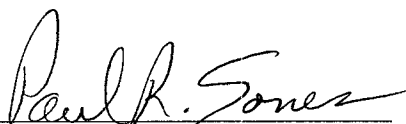
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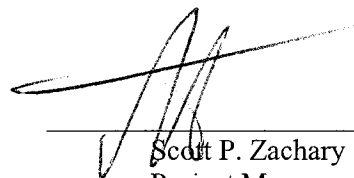
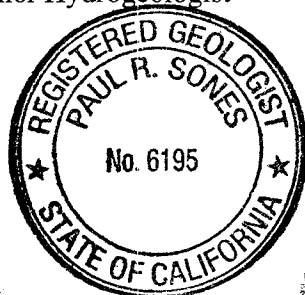
27 April 2004

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## **1. INTRODUCTION**

Haley & Aldrich, Inc. (H&A) has prepared this report on behalf of Boeing Realty Corporation (BRC) in order to document the Groundwater Monitoring Annual Event (2004 Annual Event) conducted at the Former C-6 Facility in Los Angeles, California (Site).

The 2004 Annual Event was conducted at the Site from 19 March through 25 March 2004. The program included the following activities:

- Groundwater elevation measurements in 34 wells;
- Collection of groundwater samples from 24 wells and subsequent analysis for volatile organic compounds (VOCs) by US Environmental Protection Agency (EPA) Method 8260B; and
- Monitored natural attenuation (MNA) parameter measurements in 24 wells for dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, conductivity, and temperature.

This report provides documentation and discussion of the 2004 Annual Event.

## **2. SITE BACKGROUND**

### **2.1 Site Location**

The Site is located at 19503 South Normandie Avenue, in Los Angeles, California. The Site occupies approximately 170 acres in an area located between the cities of Torrance to the west, and Carson to the east.

The Site is bound on the north by 190<sup>th</sup> Street; on the east by Normandie Avenue; on the west by the former Industrial Light Metals (ILM) facility; and on the south by the former Montrose Chemicals facility and a residential area. A Site location plan is included as Figure 1; a Site plan as Figure 2.

### **2.2 Site History**

The Site was reportedly used for the manufacturing of aircraft and aircraft parts for 40 years, between 1952 and 1992. Prior to that time, industrial use of the Site included aluminum and steel production. Before 1940, the Site was reportedly farmland. A limited amount of assembly and warehouse related activities continued through mid-2000. The Site is currently demolished, and in various stages of redevelopment.

Groundwater investigation activities began at the Site in 1987. Forty-three groundwater monitoring wells have been installed at the Site. Twenty-one of these 43 wells have since been removed as a result of redevelopment activities. Recently, four groundwater monitoring wells and nine groundwater bioremediation wells have been installed at the Site and gauged during the 2004 Annual Event. Prefixes of Site groundwater monitoring wells include BL, DAC, WCC, TMW, XMW, CMW and MW. Table I is a compilation of the groundwater monitoring well details.

### **2.3 Regional Geology and Hydrogeology**

A description of the geology and hydrogeology of the region surrounding the Site is discussed in the Site-Wide Groundwater Assessment Report (Haley & Aldrich, 2002) and previous groundwater monitoring reports prepared by Haley & Aldrich and Kennedy/Jenks Consultants (Kennedy/Jenks Consultants, 2000).

### 3. GROUNDWATER SAMPLING PROCEDURES

#### 3.1 Monitoring Plans

The 2004 Annual Event at the Site was conducted from 19 March through 25 March 2004 by Tait Environmental Management, Inc. (TEM) field personnel. Work was conducted in accordance with the following documents:

- *Groundwater Monitoring Workplan 2004*, by Haley & Aldrich, Inc., dated 31 October 2003, approved by the Los Angeles Regional Water Quality Control Board (LARWQCB) on 12 December 2003 (Haley & Aldrich, 2003a).
- *Standard Operating Procedure, Groundwater Gauging and Sampling*, prepared by Tait Environmental Management, dated 9 September 2002.

Monitored natural attenuation sampling was conducted according to:

- *Standard Operating Procedures for Measuring Natural Attenuation Parameters at Boeing Realty Corporation Former C-6 Facility, Revision 1.0*, prepared by Haley & Aldrich, Inc., and England Geosystem Inc., dated 9 January 2001.

Activities performed during the Annual Groundwater Monitoring and Sampling event were as follows.

#### 3.2 Groundwater Elevation Measurement

- Water levels were measured in 34 Site groundwater wells on 19 March 2004 (Table II).
- Two groundwater elevation contour maps were generated based on these measurements, one for the Middle Bellflower B-Sand (MBFB) (Figure 3) and one for the Middle Bellflower C-Sand (MBFC) (Figure 4).

#### 3.3 Well Purging, Sampling and Analysis

- Twenty-five Site groundwater monitoring wells were purged and sampled from 22 March through 25 March 2004.
- At least 3 wetted casing volumes of water were purged with a submersible pump from each well.
- Well purge water was monitored for pH, temperature, and specific conductivity stability.



- Purging was completed when a minimum of three wetted casing volumes were and three consecutive measurements of pH, temperature, and specific conductance were within 10% of each other, or after five casing volumes were purged. Groundwater samples were collected from the 25 wells with a submersible pump and analyzed for VOCs by EPA Method 8260B.
- QA/QC samples were also collected and analyzed for VOCs by EPA Method 8260B. (See Section 5 for description).

### **3.4 Monitored Natural Attenuation (MNA) Parameters**

- During well purging, MNA parameters (DO, ORP, and pH) were measured in the field.

### **3.5 Field Procedures**

Field procedures for this sampling event are outlined in the documents listed previously in Section 3.1.

### **3.6 Sample Naming**

Groundwater samples were labeled in the following format, in accordance with the Boeing Data Management Plan (DMP) prepared by CH2Mhill, and dated January 2002 (CH2MHill, 2002):

For example: TMW\_10\_WG032204\_0001

Where:

TMW\_10 = the groundwater monitoring well name  
WG = Groundwater sample  
032204 = date the sample was collected (mmddyy)  
0001 = the number of samples taken from the well

### **3.7 Groundwater Monitoring Program Variances**

Groundwater monitoring well WCC-12S was scheduled for sampling during the Annual Monitoring Event; however, due to Site redevelopment construction activities, the groundwater monitoring well could not be accessed by the sampling crew and equipment (Figure 2). Well WCC-12S will be scheduled for sampling during the Semi-Annual Monitoring Event in October 2004.

#### **4. MONITORING AND SAMPLING RESULTS**

##### **4.1 Groundwater Elevations**

Field sheets for the data collected by TEM are included in Appendix A. A summary of the groundwater elevations for the 2004 Annual Event is presented in Table II.

###### **4.1.1 MBFB**

During the 2004 Annual Event, groundwater elevations at the Site in the MBFB ranged from -12.67 to -21.48 feet mean sea level (MSL), or approximately 65 feet below ground surface (bgs). Figure 3 is a groundwater elevation contour map of the MBFB (B-Sand) water-bearing zone, generated using data collected from the 2004 Annual Event. The average horizontal hydraulic gradient in the MBFB was calculated to be approximately 0.0005 to 0.0010 ft/ft to the south in March 2004. The groundwater in the MBFB appears to generally flow in a southerly direction and converge on the Site (Figure 3).

###### **4.1.2 MBFC**

During the 2004 Annual Event, groundwater elevations at the Site in the MBFC ranged from -14.53 to -15.73 feet MSL, or approximately 67 feet bgs. Figure 4 is a groundwater elevation contour map of the MBFC (C-Sand) water-bearing zone, generated using data collected from the 2004 Annual Event. The average horizontal hydraulic gradient in the MBFC was calculated to be approximately 0.00017 ft/ft to the southeast. The groundwater in the MBFC appears to generally flow in a southeasterly direction (Figure 4).

Historic groundwater levels are presented in Table III.

##### **4.2 Groundwater Quality**

###### **4.2.1 VOC Results**

Results of VOC analysis by EPA Method 8260B for the 2004 Annual Event, conducted in March 2004, are summarized in Table IV. Based on visual observations during well sampling, TEM recorded no indications of dense non-aqueous phase liquid (DNAPL) in any of the sampled wells. Based on a review of previous monitoring reports, plume geometries for trichloroethene (TCE) appear to be generally unchanged since 1999 (Haley & Aldrich, Inc. and England Geosystem Inc., 2001b and 2001c and Haley & Aldrich, Inc., 2003b and 2003c).

Figures 5 and 6 show the dissolved-phase TCE concentrations in the MBFB and MBFC, respectively. Table IV summarizes the groundwater analytical data for the wells sampled during the 2004 Annual Event.

#### 4.2.2 Field MNA Parameters

Field monitoring of DO, ORP, and pH was conducted during the March 2004 monitoring and sampling event. A summary of the March 2004 monitored natural attenuation parameters is included in Table VI, and on the Field Data Sheets in Appendix A. These parameters are generally similar to the September 2003 semiannual sampling event data, and suggest that in-situ conditions have not changed. The distribution of DO and ORP suggests evidence of intrinsic biotransformation of VOCs in the potential source area near former Buildings 1, 2 and 36, as well as along the southern property boundary. It appears that DO has been depleted within the areas of TCE and 1,1-DCE-impacted groundwater. ORP is negative within the Building 1/36 area (WCC-3S and WCC-6S), suggesting anaerobic reducing conditions.

## **5. QUALITY ASSURANCE/QUALITY CONTROL**

### **5.1 Field Quality Control Samples**

#### **5.1.1 Field Duplicates**

Two duplicate groundwater samples were analyzed for VOC concentrations from wells TMW-10, TMW-11 and CMW026. These results are included in Table IV. Duplicate laboratory data can be used to measure how well replicate measurements reproduce, and also to estimate overall method precision. Relative percent difference (RPD) is a measure of precision, and is calculated as follows:

$$(\text{Result 1} - \text{Result 2}) / \frac{1}{2} (\text{Result 1} + \text{Result 2}) * 100\%$$

The RPD will often vary with the concentration of analyte; RPD lessening as the concentration increases. If the variation is greater than plus or minus 15%, but less than 100%, the reported concentrations are up to standard. If the variation is greater than 100%, the data is subject to further evaluation (i.e., comparison with historic data from the well). The data from TMW-10, TMW-11 and CMW026 and their respective duplicates were reported to have RPDs less than or equal to 57%, which indicates that the reported concentrations are up to standard.

#### **5.1.2 Equipment Rinsate Blanks**

Four equipment rinsate blanks were collected during the sampling event after cleaning the sampling equipment with deionized water. These rinsate samples were analyzed for VOCs by EPA Method 8260B. Low concentrations of VOCs (<3 µg/l) were detected in the equipment blank samples as shown on Table IV.

#### **5.1.3 Field Blanks**

Four field blanks were collected during the sampling event with laboratory-supplied water to check for contamination by sampling methodology. These field blank samples were analyzed for VOCs by EPA Method 8260B. Low concentrations of VOCs (<3 µg/l) were detected in the field blank samples as shown on Table IV.

#### **5.1.4 Trip Blanks**

One laboratory-prepared trip blank was shipped to the laboratory each day to check for cross-contamination. The samples were analyzed for VOCs by EPA Method 8260B. Concentrations of acetone (up to 18 µg/l) and 1,2,4-trichlorobenzene were detected in the trip blanks, as shown in Table IV.

#### **5.1.5 Data Validation and Laboratory QA/QC Samples**

Final laboratory-certified reports and laboratory quality control procedures are included on the compact disc (CD) as Appendix B.

Data validation was performed on 10% of the samples. Of the 10%, Tier I data validation was performed on 55% of the samples, Tier II data validation was performed on 45% of the samples; Tier III data validation on 5% of the samples. Based on the data validation results, the data collected during this event is adequate for continued characterization and monitoring of VOCs in groundwater beneath the Site. Data validation results are provided in Appendix C. Appropriate data qualifiers, as determined by Laboratory Data Consultants, Inc. (LDC) (data validation subcontractor), have been included where appropriate.

## 6. LIMITATIONS

This report was prepared by Haley & Aldrich under the professional direction and review of the registered professionals listed on the cover page. The work described herein was conducted in accordance with generally accepted professional engineering and geologic practice. No other warranty exists, either expressed or implied.

In addition to data collected by and observations made by Haley & Aldrich personnel, this report incorporates Site conditions observed and described by others as reported in records available to Haley & Aldrich as of the date of report preparation. Haley & Aldrich relied—in part—on such data collected by others in the development of interpretations about environmental conditions at the Site. The accuracy, precision, or representative nature of data originally generated by others could not be independently verified by Haley & Aldrich and would be beyond the scope of this project.

In addition, the passage of time may result in changes in Site conditions, technology, or economic conditions which could alter the findings and/or recommendations of the report.

## REFERENCES

1. CH2MHill, 2002. "Data Management Plan, prepared for The Boeing Company." Revision 04, January 2002.
2. Haley & Aldrich, Inc. and England Geosystem, 2001a. "Standard Operating Procedures for Measuring Natural Attenuation Parameters at Boeing Realty Corporation Former C-6 Facility." Revision 1.0, 9 January 2001.
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9. Kennedy/Jenks Consultants, 2000. "Groundwater Status Report," dated 27 October 2000.
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